Pilot's Guide

Engine Data Management

EDM-700

EDM-800

Table of Contents

How to Change Modes (page 7)

EDM-700 enters Automatic mode two minutes after power up
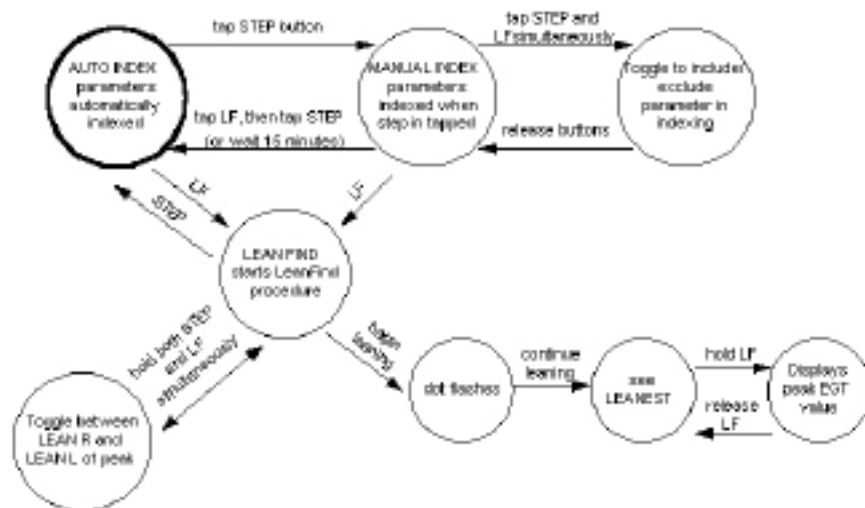
Section 1 -Introduction

Product Features

EDM 700/800 Standard Instrument:
- Hands-free, automatic scanning
- All programming done from the Front Panel
- LeanFind   finds the first and last cylinder to peak with true peak detect—eliminating a false peak detection. Displays both leaned temperature below peak and peak
- Battery voltage with alarm
- 24 Programmable alarm limits
- Normalize view
- DIF low to high EGT with alarm
- RS-232 Output for data logging in real time
- Oil temperature option
- EGTs to stable 1°F resolution
- Shock cooling monitored on *every* cylinder
- User selectable index rate
- Fast response probes

Fuel Flow Option:
- Solid-state pulse generating rotor fuel flow transducer
- Fuel quantity measured in gallons, kilograms, liters, or pounds
- Low fuel quantity alarm
- Low fuel time alarm
- GPS interface
- Instantaneous fuel flow rate
- Total amount of fuel consumed
- Total fuel remaining
- Time to empty at the current fuel flow rate

Long Term Data Memory:
- Records and stores data up to 30 hours
- Non-volatile memory
- Post-flight data retrieval
- Download to Palm™ Computer
- Data retrieval software

EDM-800 %HP, MAP and RPM:
- Displays % horsepower and RPM
- Automatically calculates percent horsepower

Engine Data Management

The EDM Engine Data Management system is the most advanced and accurate piston engine-monitoring instrument on the market. Using the latest microprocessor technology, the EDM will monitor up to twenty-four critical parameters in your engine, four times a second, **with a linearized thermocouple accuracy of better than 0.1 percent or 2 F°.**

As your built-in flight engineer, the EDM is constantly "red line" checking: all critical parameters are automatically checked four times a second, regardless of the current display status. Leaning is accomplished quickly and automatically using the LeanFind   procedure. With the

For Your Safe Flight   Page 5

EDM it is now possible to have substantially more diagnostic information available to you in a timely and usable manner.

The real-time serial data port—a standard feature—permits you to record scanned parameters in real-time using a user-supplied Palm™ Computer or laptop PC.

Benefits of Proper Mixture Control

- Improved engine efficiency
- Greater fuel economy
- Smoother engine operation
- Longer spark plug life
- Reduced maintenance costs
- Reduced operating costs
- Proper engine temperatures
- Reduced engine vibration

JPI Probes

Temperature information processed by the EDM is captured by **fast response**, grounded *JPI* temperature probes, that accurately measure the small temperature changes—as small as 1°F—that occur during mixture adjustment.
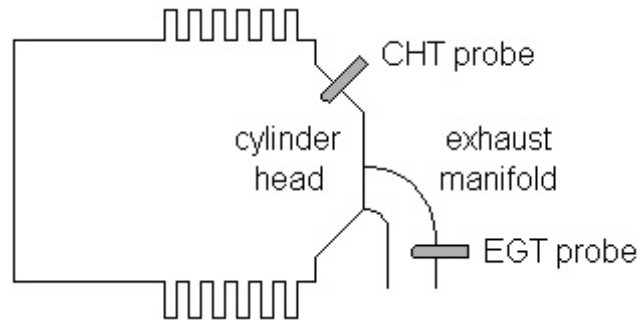
Temperature and Mixture

In a piston engine only a small portion of the energy from combustion produces movement of the piston during the power stroke. The majority of energy passes into the exhaust pipe as hot gasses. By monitoring the temperature of these exhaust gasses you will have an indication of the quality of the combustion process. Low compression, non-uniform fuel distribution, faulty ignition, and clogged injectors diminish the efficiency of the combustion process that generates power.

From the cockpit you can adjust the fuel/air ratio by a process called *leaning*. Retarding the mixture control changes the fuel/air ratio and hence the resulting Exhaust Gas Temperature (EGT).

The following figure depicts the mixture and temperature relationship.
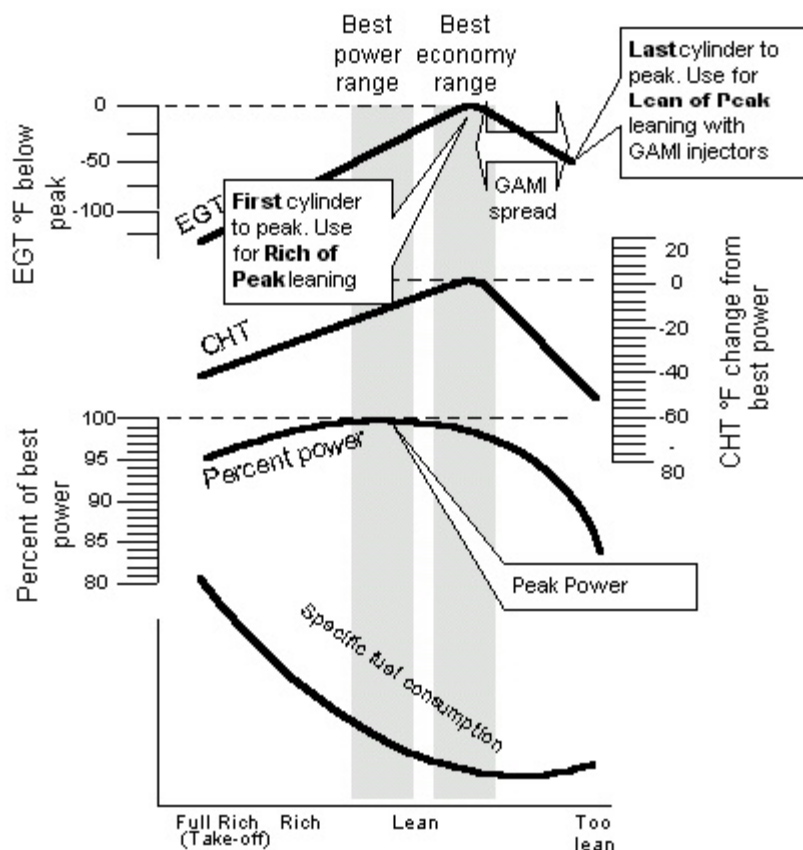
As the mixture is leaned, EGT rises to a peak temperature, and then drops as the mixture is further leaned. Peak *power* occurs at a mixture using more fuel than at peak EGT. Best *economy* occurs at peak EGT. Accurate leaning yields optimal engine temperatures. By being able to precisely adjust the mixture, your engine can produce either the best fuel economy or maximum power, whichever you choose.

A single EGT gauge merely gives you an average of each cylinder's temperature: some cylinders can be too rich, while others too lean. Variations produced by differences in fuel distribution, ignition, and

compression will cause each cylinder to follow its own mixture and temperature relationship such that one cylinder will reach peak before another.

Section 2 -Displays and Controls

The EDM monitors engine temperatures and voltages, assists in adjusting the fuel/air mixture, and helps diagnose engine malfunctions. There are three components of the user interface:

*   Analog display including cylinder number and index dot
*   Digital display for numeric readouts and messages
*   Two front panel operating buttons.

Displays
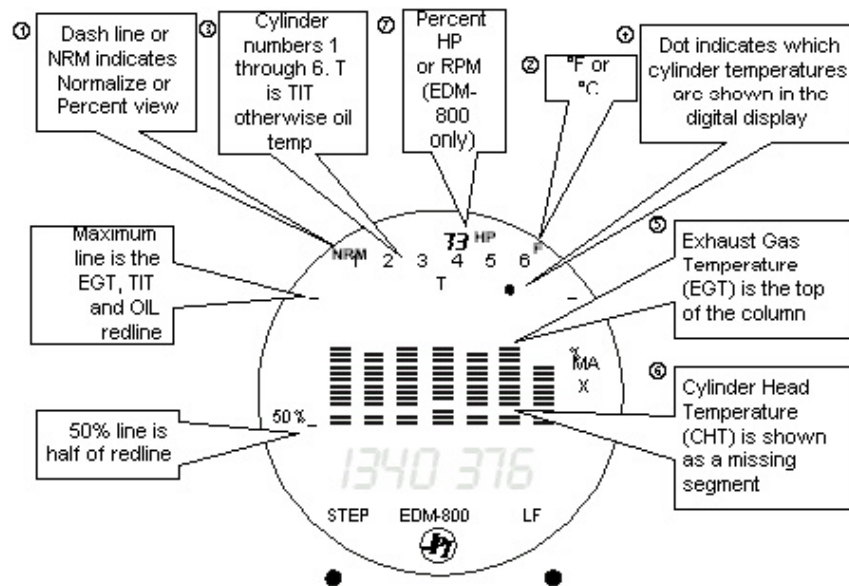
Analog Display

The upper half of the face of the EDM is the analog display with %HP.

The following is a description of the analog display, from top to bottom. Numbers in circles refer to features in the above diagram.

①*Normalize and Percentage View Indicators*

- Percentage view: when there is a dash — near the P at the top of the display (EDM-700) or NRM is not lighted (EDM-800), the columns indicate percent of EGT red line. Each column is composed of a stack of segments. A maximum height column depicts 100 % of red line and a one segment-high column depicts 50 % of red line. For example, if the red line is 1650°F, a maximum height column represents 1650°F and a one segment-high column represents half that value, or 825°F. The *Percentage view* permits comparison of EGTs *across all* cylinders. Hotter cylinders display higher columns than cooler cylinders.

- Normalize view: when there is a dash _ near the N at the top of the display (EDM-700) or the letters NRM are lighted on the left side (EDM-800), the EGT columns are displayed normalized. When you change to the Normalize view, all column peaks are set to the same half-height level for trend analysis. Any changes are shown as an increase or decrease in column height. **A one-segment change in column height represents a 10°F change**. The Normalize view permits rapid visualization of EGT *trends*, rather than a percentage of red line. You should use normalize in level cruise and run-up.

To toggle between Percentage and the Normalize views, hold the LF button for five seconds until the display changes. The analog display becomes half height and the display changes to the Normalize view. Selecting the Normalize view does not affect the digital display nor alter the parameter sequence. The CHT display—described later—is not affected by the Normalize or Percentage view.

You may select the Normalize view in either the Manual or Automatic mode. Normalize view is most helpful for engine trend monitoring of each cylinder's operation. For example using the Normalize view during engine run-up, a fouled spark plug will appear as a higher column.

A common misapplication is to be in the Normalize view and then change your power setting, causing all columns to go off scale, high or low. Set to the Percentage view before adding or reducing power. Always set Percentage View when beginning your descent.

②*Temperature Units (•F or •C)*
- **°F** temperatures in the digital display are in Fahrenheit degrees.
- **°C** temperatures in the digital display are in Celsius degrees.

To change the display of engine temperatures see "Changing the Alarm Limits" on page 45.

③④*Cylinder Numbers and Dot Index*

A row of numbers **1** through **6** and the letter **T** are the column labels for the analog display. The **1** through **6** are the cylinder numbers. If the TIT option is installed, the **T** denotes the last column is displaying Turbine Input Temperature (TIT) as a column. If the **T** is absent and the Oil temperature option is installed, the last column displays Oil temperature. If both TIT and Oil temperature options are installed, the last column displays TIT and the missing segment displays Oil temperature. The highest Oil temperature segment will flash only when the digital display shows OIL. The highest TIT segment will flash on when the digital display shows TIT. A round dot under the numbers 1 through 6 indicates that particular column is shown numerically in the EGT and CHT digital display.

⑤⑥*Bar Graph EGT and CHT*

Each column in the bar graph is composed of a stack of segments. The total height of each column represents the **EGT** and the missing segment in the column represents the **CHT.**

- In the Percentage view, the EGT, TIT, and Oil temperature resolutions depend on the programmed red line limits.

- CHT is displayed by a missing segment and should be interpreted as follows: a missing segment corresponds to the CHT in 25 F° increments, starting at 300°F at the bottom. In the example shown here, the CHT is 400°F. If the EGT bar is lower than the missing CHT segment, then the CHT will be indicated by a single isolated lighted segment.

The CHT display is the not affected by mode or view.

⑦*Percent HP or RPM (EDM-800 only)*

Displays percent of rated HP or RPM depending on pilot programming.

Digital Display

Beneath the bar graph is the 9-segment alphanumeric display.

EGT and CHT

When the dot index is beneath a cylinder number, 1 through 6, the digital display shows the EGT on the left (four digits) and the CHT on the right (three digits). Other parameters are displayed in the digital display as described in the subsection "Parameter Scan—Systems without Fuel Flow Option" on page 10.
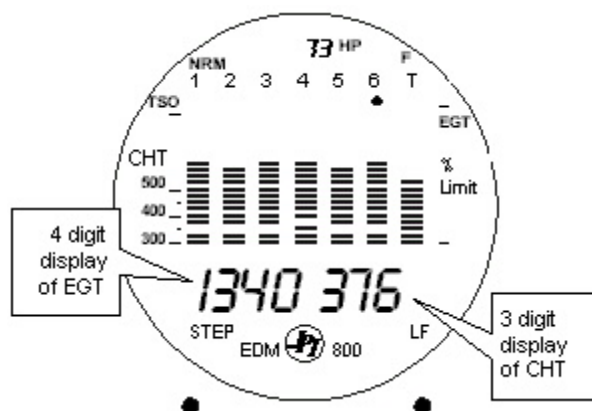
Display Dimming

The entire display panel features automatic dimming. Allow ten seconds for the display to adjust to ambient lighting conditions.

Modes

There are three standard operating modes of the EDM: *Automatic, Manual,* and *LeanFind*. These modes will be described in more detail beginning on page 11. Most of the time you will operate the EDM in the Automatic mode. When you first turn on the power the EDM starts in the Manual mode, but will enter the Automatic mode after two minutes. The three modes affect primarily the digital display.

Automatic Mode

Just tap the LF button, then tap the STEP button. No user intervention is required to use this mode. Each cylinder and each parameter value is automatically sequenced and shown in the digital display for a few seconds.

Manual Mode

Just tap the STEP button. Automatic stops. Each indexed parameter is frozen in the digital display until you manually index to the next parameter by tapping the STEP button. If no button is depressed for 15 minutes, the Automatic Mode will resume.

LeanFind Mode

Simply pre-lean, tap the LF button and begin leaning. The EDM will assist you in finding the first cylinder to peak.

Buttons

STEP button   **LF button**

Buttons, Front Panel

Two operating buttons control all functions of the EDM.

The term *tap* will be used to denote pressing a button momentarily. The term *hold* will be used to denote pressing and holding a button for five seconds or longer.

STEP Button

Located on the lower left side near the instrument face.

- In the Automatic mode, *tapping* the STEP button will stop and change to the Manual mode. Then each *tap* of the STEP button will display the next parameter in the sequence.

- In the LeanFind mode *tapping* the STEP button will terminate the LeanFind mode and change to the Automatic mode.

Secondary functions of the STEP button include:

- In the Manual mode *holding* the STEP button will display the previous parameters in the sequence (rapidly backwards).

- In the programming procedures, *tapping* the STEP button will advance to the next item in the list.

- When an alarm is displayed, *tapping* the STEP button will temporarily delete that alarm from appearing for the next ten minutes.

- When an alarm is displayed, *holding* the STEP button until the word OFF appears will delete that alarm from appearing for the remainder of the flight.

LF Button

Located on the lower right side near the instrument face.

- In Automatic or Manual modes, *tapping* the LF button will change to the LeanFind mode.

- In Automatic or Manual modes *holding* the LF button for three seconds will toggle between Percentage and Normalize views.

- In the LF mode *holding* the LF button after peak EGT is found will display peak EGT.

- In the LF mode *tapping* the LF button will **mark** a data record in long term memory and display will flash SNAP.

Secondary functions of the LF button include:

- In the pilot programming procedure, *holding* or *tapping* the LF button is used to increment or decrement parameter values and toggle between Yes and No answers to questions.

STEP and LF Buttons

- Holding both the STEP and LF buttons simultaneously for five seconds changes to the pilot programming procedure.

- Holding both the STEP and LF buttons simultaneously for five seconds after entering LeanFind mode but before beginning to lean will toggle between leaning "rich of peak" and "lean of peak."

- Tapping both the STEP and LF buttons simultaneously in Manual mode toggles to include or exclude the displayed parameter from the Automatic mode. It has no affect on the displayed parameters in the Manual mode.

Parameter Scan—Systems without Fuel Flow Option

The EDM steps through the engine parameters in a specific sequence.
Listed below is the sequence, parameter description and example of the
digital display.

Parameter	Example	Comments
Voltage, System Bus	I4.2 BAT	BATTERY VOLTAGE
Outside Air Temperature	8I OAT	**°F or °C**
Induction Air Temperature	I25 IAT	**Out of the intercooler**
Compressor Discharge Temperature	300 CDT	**Into the intercooler**
Carburetor Temperature	–22 CRB	**Not available when CDT is installed**
Difference between hottest and coolest EGT	80 DIF	**Dot indicates most widely deviating cylinder**
EGT, CHT	I340 376	**EGT, left, CHT, right. Dot indicates cylinder**
TIT, Turbine Inlet Temperature	I370 TIT I370 TI2	**Turbine #1, left Turbine #2, right**
Oil Temperature	I 7 8 OIL	
Shock Cooling	–30 CLD	**Dot indicates fastest cooling cylinder**

The display will pause at each parameter for four seconds in the
Automatic mode. (The four second pause time can be changed.) In the
Manual mode, tap the STEP button to advance to next parameter. Only
the parameters for the options that are installed will be displayed;
uninstalled parameters will not appear.

Section 3 -Operating Procedures

Diagnostic Testing on Startup and During Flight

When your EDM is first turned on, all digits light up for a few seconds, permitting you to check for non-functional segments. Then each column is self-tested in sequence while the EDM tests internal components, calibration and integrity of the probes. If a problem is found, it will be displayed as OPEN PRB or CAL   ERR, followed by the name of the probe or channel.

Display	Channel	Display	Channel	Display	Channel
EGT I	EGT #1	CHT I	CHT #1	OIL	Oil
EGT 2	EGT #2	CHT 2	CHT #2	TIT I	TIT #1
EGT 3	EGT #3	CHT 3	CHT #3	TIT2	TIT #2
EGT 4	EGT #4	CHT 4	CHT #4	CDT CRB	CDT carb
EGT 5	EGT #5	CHT 5	CHT #5	IND	IAT
EGT 6	EGT #6	CHT 6	CHT #6	OAT	OAT

During flight, probes are constantly checked for inconsistent or intermittent signals. A faulty channel or probe encountered during start-up or during flight will be deleted from the sequence, producing a missing column or blank digital data.

Modes

The EDM has three different operating modes: *Automatic*, *Manual* and *LeanFind*. When you first turn on the power the EDM starts in the Manual mode, but will enter the Automatic mode after a few minutes. The Automatic mode provides you with engine monitoring information for the majority of flight conditions. To adjust the mixture, use the LeanFind mode. And to display specific parameters, use the Manual mode. In both the Automatic and Manual modes the analog display shows a bar graph of EGT and CHT for each cylinder and the TIT and Oil temperature.

Automatic Mode

Just tap the LF button, then tap the STEP button. No user intervention is required to use this mode. In the Automatic mode the EDM displays the parameter sequence at a user-selected rate (see "Personalizing" on page 36).

Individual parameters can be excluded from the *Automatic mode*: tap STEP to enter the Manual mode. Tap STEP to index to the parameter you want to exclude. Then tap both the STEP and LF buttons simultaneously. Excluded parameters display a decimal point before the parameter name. For example:

Included: `I84        OIL`   Excluded: `I84  .OIL`

Tapping the STEP and LF buttons simultaneously will toggle back and forth between *include* and *exclude*.

- Every time you turn on the EDM, all parameters are reset to be included.

- *All* installed parameters are always displayed in the Manual mode. Exclusion only applies to the Automatic mode.

- All parameters are checked for alarm conditions every second *regardless of their included or excluded status*.
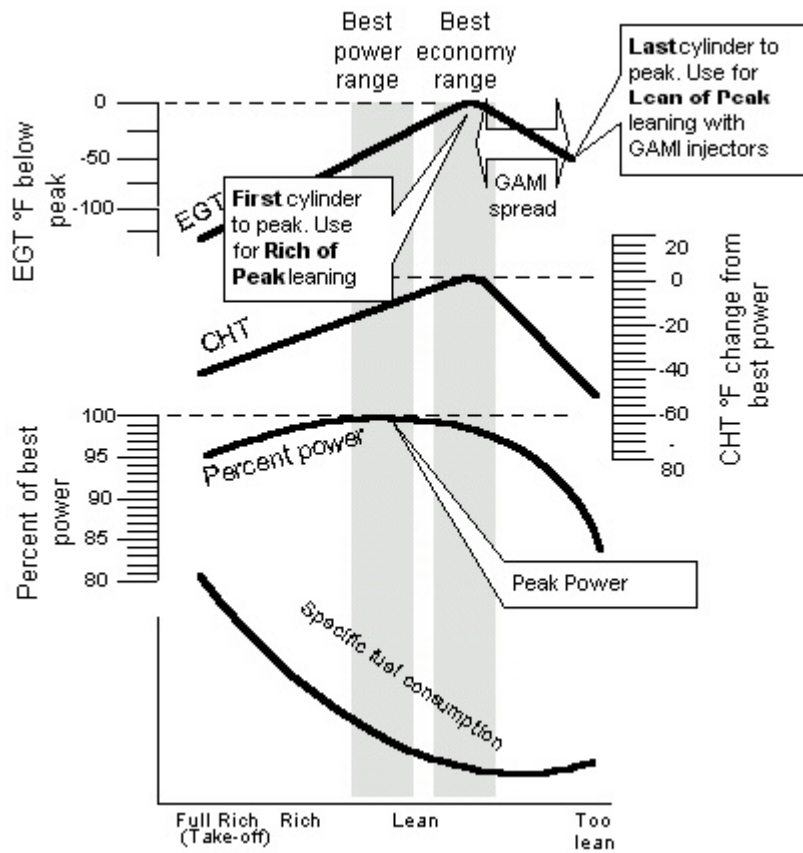
Manual Mode

Just tap the STEP button. Use the Manual mode when you want to monitor one specific parameter such as shock cooling during descent, or a particular cylinder temperature during climbs. To change to the Manual mode, tap the STEP button once. Subsequent taps will index the digital display through the parameter sequence (see "Parameter Scan—Systems without Fuel Flow Option" on page 10). To exit the Manual mode and return to the Automatic mode, either tap the LF button and then tap the STEP button or wait 15 minutes (see "How to Change Modes" in the front of this manual). You may disable the Automatic mode by setting "0" for scan rate.

LeanFind Mode—Leaning Rich of Peak

JPI's EDM-700 and EDM-800 provide two methods of leaning: lean **rich of peak** (`LEAN   R`) or **lean of peak** (`LEAN    L`)**.** The standard method is to lean about 20° rich of peak. With the advent of GAMI injectors it is now possible to set the mixture lean of peak—saving fuel and running the engine cooler. Teledyne Continental recommends lean of peak for the Malibu. This manual primarily describes the rich of peak

method, and provides the procedure for the lean of peak method. The **default** method is set to **rich of peak**.

Simply pre-lean, tap the LF button and begin leaning. Upon reaching cruise configuration, you will use the LeanFind mode to identify the first cylinder to reach peak EGT.

LeanFind Procedure—Step-by-Step

	Procedure	Example	Comments
1	Establish cruise at approx. 65 to 75% power.		
2	**PRE-LEAN THE MIXTURE TO 50°F ESTIMATED RICH OF PEAK EGT ON ANY CYLINDER: _____°**	`I490` `370`	*For your *first flight* with the EDM, use the method shown below.
3	Wait one minute		Let engine stabilize.
4	Tap the LF button	`LEAN` `R`	Start LeanFind. (Optionally to change to "lean of peak" method, hold both STEP and LF simultaneously.)

5	Lean the mixture—approx. 10°/second—while observing the display. When there is a 15°F rise in EGT, LeanFind mode becomes active.	`I520`
		`LF`
		Without FF
		`I520`
		`I3.8`
		With FF
			Flashing cylinder DOT indicates hottest cylinder and that LeanFind mode is active.

6	Stop leaning when a column begins flashing. You will see `LEANEST` for two seconds, followed by:	`I545`
		`SET`
		or with
		Fuel Flow
		`I545`
		`I 2.4`
			Flashing cylinder dot & column indicates leanest cylinder. (SET means Set the mixture.) Due to thermal inertia this will usually be about -15°F lean of peak.

7	If you hold LF, peak EGT will be displayed while the LF button is held down.	`I560` `PK`	Captured peak EGT value is displayed.

8	Slowly enrich the mixture. the temperature will increase, returning to peak. Stop enriching at the desired EGT.
	
	Best economy
	Best power
		`I560`
		`SET`
		
		`I560`
		`SET`
		`I460`
		`SET`
			• Peak EGT for best economy
			• 100° rich of peak for best power

9	If you have chosen the Lean of Peak method, at step 5 continue leaning until the last cylinder has peaked.	`-I5`
		`SET`
		`OR`
		`-I5`
			Only for GAMI injected engines. When each cylinder reaches peak, the cylinder number will begin flashing.

	I2.3	

*Determining the pre-lean value:** while in cruise at under 65 percent power, choose any cylinder and lean that cylinder to peak EGT in the Manual mode or to engine roughness, whichever occurs first. Note the peak, subtract 50° and write the resulting number in the space provided in step 2.

LeanFind Procedure—General Explanation

Lycoming and Continental engines have established specific restrictions on leaning that must be followed, such as percentage of power, climb leaning, and TIT limits. Lycoming recommends operation at peak EGT for power settings of 75% or lower, while Continental recommends operation at peak EGT for power settings of 65% or lower. This guide is not meant to supersede any specific recommendations of the engine manufacturer or airframe manufacturer.

It is your responsibility to know your aircraft's limitations.

Pre-lean the mixture to about 50° below peak. After pre-leaning, wait for one minute for the temperatures to stabilize. Next, begin the leaning process by tapping the LF button. This tells the EDM to begin looking for a 15° rise in EGT for any cylinder. Begin leaning the mixture. When a 15° rise occurs, eliminating false peaks, the LeanFind mode becomes activated shown when the cylinder dot above the column of the hottest cylinder begins flashing. **The LeanFind mode is not active until a cylinder dot is blinking.**

With the Fuel Flow Option, instead of seeing the word LF in the display, you will see numerical fuel flow rate during the leaning process on the right side of the digital display, for example I2.4. This allows you to observe the EGT rise and at the same time watch the fuel flow rate decrease.

To show the progress of the leaning process, the EDM selects the hottest cylinder for reference in the digital display. In the example below, the I360 is the current temperature of the hottest cylinder.
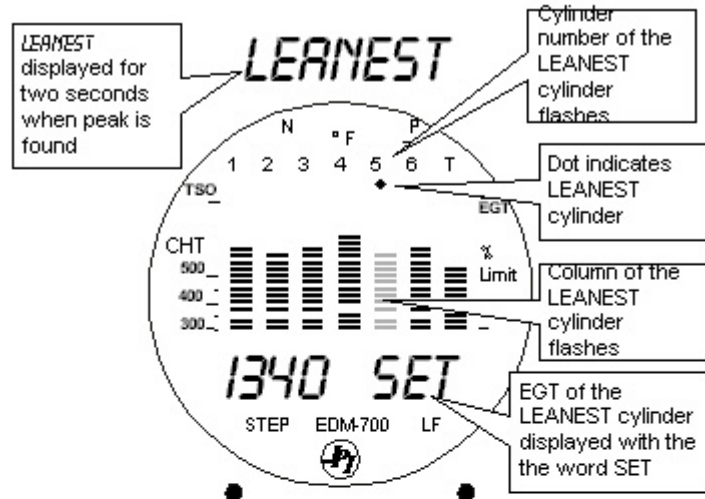
When LF is activated:
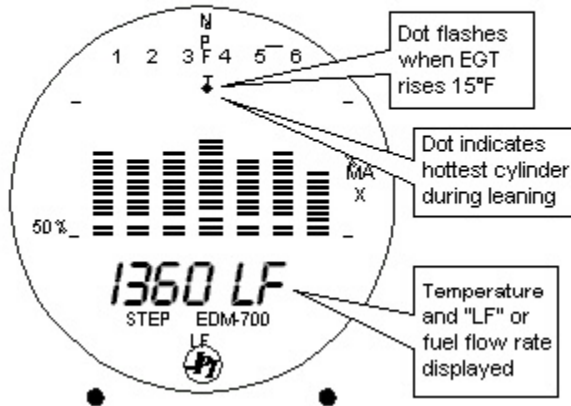
Continue leaning slowly. With a vernier mixture control, turn the knob about a quarter turn every second. With a non-vernier or quadrant mixture control, lean slowly and smoothly about 1/16 inch every five seconds. Eventually, one cylinder will reach peak before any of the other cylinders. The EDM will determine this automatically. *Notice that this cylinder does not necessarily have the hottest EGT.*

The EDM will indicate success in finding a peak by displaying the words LEANEST for two seconds, followed by flashing the column and displaying the value of the EGT of the cylinder that peaked first. The word SET will also be displayed. (With the Fuel Flow Option the current fuel flow rate will be displayed on the right side of the digital display instead of the word SET.) The flashing cylinder will be locked—or set—into the digital display during the remainder of the LeanFind procedure to allow you to set the final mixture. The peak EGT value is remembered by the EDM and will be displayed as long as you hold the LF button.
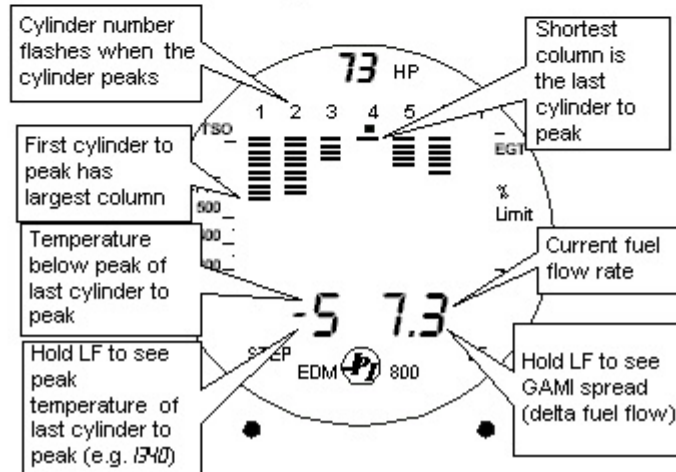
You may now enrichen the mixture to operate at peak or continue enriching to 100° rich of peak, or a value of your choice, consistent with the procedures defined in your aircraft engine manual.

If you lean too much, the EGT will drop and the engine will be operating

Leaning Rich of Peak

LEANEST displayed for two seconds when peak is found

Cylinder number of the LEANEST cylinder flashes

Dot indicates LEANEST cylinder

Column of the LEANEST cylinder flashes

EGT of the LEANEST cylinder displayed with the the word SET

Leaning Lean of Peak

Cylinder number flashes when the cylinder peaks

First cylinder to peak has largest column

Temperature below peak of last cylinder to peak

Hold LF to see peak temperature of last cylinder to peak (e.g. *1340*)

Shortest column is the last cylinder to peak

Current fuel flow rate

Hold LF to see GAMI spread (delta fuel flow)

lean of peak.

**Lean of Peak Leaning with GAMI injectors**

To use the "lean of peak" method, tap LF and then immediately hold both STEP and LF until you see LEAN L. Once you begin leaning

(flashing dot) you cannot change leaning methods. You may toggle back to `LEAN   R`   by holding both buttons again.

In the "lean of peak" method the columns will **invert** with the first to peak progressing down from the top of the display. The inverted column scale is **5° per segment** below peak. As you continue to lean past peak the dot of the each successive cylinder will flash as it peaks. The peaks will be shown as an **inverted bar graph;** when the last cylinder peaks its column will flash. The analog display is an inverted bar graph showing where each cylinder peaked. When the LF button is held the display will show the delta fuel flow between the first and last to peak (GAMI Spread), as well as the richest peak EGT.

Turbocharged Engines

The leaning process for turbocharged engines is by reference to the first cylinder or TIT to reach peak. However, the TIT *factory red line* may limit the leaning process. TIT red line is generally 1650°F, and up to 1750°F in some installations. In the LeanFind mode the T column—TIT—is included in the procedure. If during leaning the TIT exceeds red line by less than 100° for less than one minute, the LeanFind procedure will continue to operate, allowing you to complete the leaning process. Otherwise the digital display will show, for example, `I650 TIT` and `TIT` will flash. You will notice that in some cases the TIT reads **100°F hotter than the hottest EGT**. This is caused by unburned fuel in the exhaust and igniting.

EGT Probe Response Time
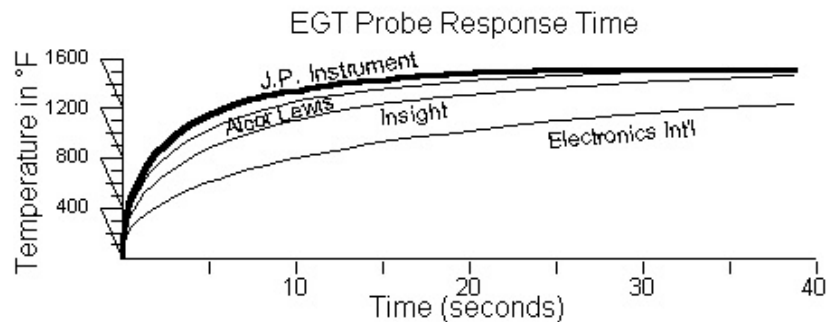
The reduced size of the ***JPI*** **Hastaloy-X-tip probes produces faster response** and more accurate than the massive factory installed probe. Therefore ***JPI*** probes may read as much as 100°F higher than the factory installed probe. However, note that the engine was certified with

the factory-installed probe and gauge, and this gauge reading is the limiting factor when adjusting your engine.

Operation for each Phase of Flight

Engine Run-Up

Suggested setup:	*Verify:*
Runup RPM	• uniform rise of about 50°F in all EGTs in single magneto operation
Normalize view	• uniform rise of EGTs with application of the mixture control.
Manual mode	***Be alert for:***
	• unusually low voltage (less than nominal battery voltage)
	• cold OIL
	• abnormally high CHT
	• a higher EGT on one cylinder in dual magneto operation—indicates fouled spark plug.

Include your EDM on your run-up checklist.

Take-Off, Climb, and Full Throttle Operations

Suggested setup:	*Verify:*
Percentage view	• EGTs and CHTs consistent with past climbs. EGTs should be the 1100 to 1250°F range (100° to 300°F cooler than cruise) due to fuel cooling.
Automatic mode	***Be alert for:***
	• high EGT in one cylinder, 300°F above the others may indicate plugged injector or leaking manifold gasket.
	• If all EGT bars go off scale to the top of the column, be sure you are not in *Normalize* view.

At high density altitude an overly rich mixture can significantly reduce engine power.

Cruise

After the engine is warmed up, use LeanFind to lean the mixture.

Suggested setup:	*Be alert for:*
Percentage view	• uneven EGTs or CHTs (carbureted engines). Make fine adjustments to throttle, then RPM, then mixture to level the display columns.
Automatic mode	• abnormal patterns of EGTs and CHT. (see "Diagnosing Engine Problems" on page 22).

Descent

Suggested setup:	*Be alert for:*
Percentage view	• CLD: shock cooling alarm is set to –60°F. Average cool rates of –40°F/minute to –60°F/minute are normal, depending on the engine size.
Manual mode	

Shock Cooling

Cooling the cylinders too fast can result in cracking and eventual failure. Lycoming Service Instruction 1094D (March 25, 1994) on *Fuel Mixture Leaning Procedures* **states:**

> "At all times, caution must be taken not to shock cool the cylinders. The maximum recommended temperature change should not exceed 50°F per minute."

JPI checks shock cooling on all cylinders displaying the highest reading cylinder.

Common Misapplications

Some of the more common misapplications made by first-time EDM users are presented here in an attempt to help you avoid similar problems.

Problem	Situation	Correction
LeanFind finds a "peak" too soon.	Failure to pre-lean before performing LeanFind or stopping while leaning.	Follow the pre-lean procedure in the section "LeanFind Mode" on page 13.
	Leaning too slowly.	Lean more quickly.
Peak not found	Lean Find not activated or stopping while leaning	Lean at the speed of approximately 10°F per second.
Off-scale EGT bars, too high or low	You forgot that you set the EDM in the Normalize view and later observe off-scale EGT bar readings.	The higher sensitivity of the Normalize view can quickly go too high or low off-scale with only small changes in EGT.
First cylinder to peak is not the hottest	This is normal. The first to cylinder peak is not necessarily the hottest.	
EGTs rise during single magneto check	This is normal, due to incomplete combustion persisting longer.	
EGTs not uniform during low power operation	This is normal. Fuel and air distribution is not optimal at low power settings.	
No display of %HP	Fuel flow not reading	Fuel Flow option is required for HP

Section 4 - Diagnosing Engine Problems

Typical Normal Parameters

The follow chart lists typical *normal* parameter values that you will observe for most general aircraft engines.

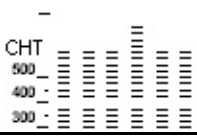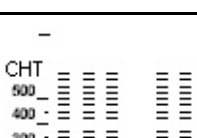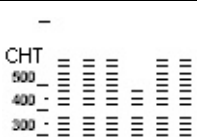| *Parameter*	*Normal range*	*Comments*
EGTs in Cruise	1350°F 1550°F	• under 200 HP • high performance • EGT should drop 200°F when full throttle is applied
EGT span (DIF)	70 to 90°F 120 to 150°F	• fuel injected • carbureted
TIT	1600°F average	• 100° higher than EGT
CHTs	350°F (OAT 60°F) 410°F	• normally aspirated • Turbocharged
CHT span	50 to 70°F	
OIL	200°F	• oil cooler thermostat opens at 180°F
Shock cooling*	-40°/minute -55°/minute -200°/minute	• tightly cowled • Bonanza • helicopter

* Maintain a cooling rate of less than -60°/minute. You will find that the cylinder with the greatest shock cooling will shift from front cylinders (during climb out) to the rear cylinders (during descent).
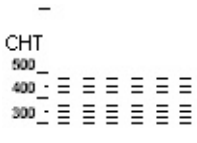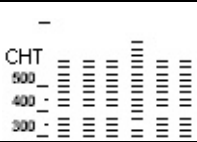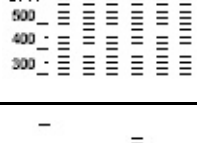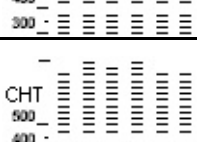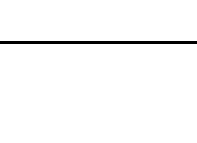
If one CHT is reading 20° to 50° above or below the others, this may be due to that cylinder having a spark plug gasket probe instead of a bayonet probe. This is necessary because the aircraft's factory original CHT probe is occupying the socket in the cylinder head rather than the EDM. This is normal. If the discrepancy is greater, be sure the spark plug gasket probe is mounted on the *top* spark plug. An adapter probe is
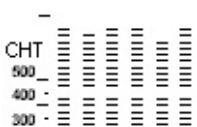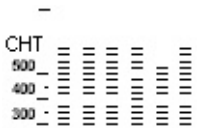
available to occupy the same socket as the factory original probe.
Contact your dealer.

Engine Diagnosis Chart

The following chart will help you diagnose engine problems in your aircraft. (Views are Percentage views). Notice that there will be always one CHT that is shown hotter than the others.

Display	Symptom	Probable Cause	Recommended Action
	75° to 100° EGT rise for one cylinder during flight	Spark plug not firing due to fouling, faulty plug, wire or distributor.	Enrich mixture to return EGT to normal. Have plugs checked.
	EGT Increase or decrease after ignition system maintenance	Improper timing: high EGT retarded ignition; low EGT advanced ignition.	Check EGT for each magneto to determine any uneven timing.
	Loss of EGT for one cylinder. Engine rough	Stuck valve. Other cylinders are okay.	Have valve train checked.
	Loss of EGT for one cylinder; no digital EGT	Failed probe or failed wire harness.	Swap probes to determine if probe or wire harness is bad.
	Decrease in EGT for one cylinder	Intake valve not opening fully; faulty valve lifter.	Have valve lifter or rocker arm checked.
	Decrease in EGT for one cylinder at low RPM	Low compression.	Check compression.

Display	Symptom	Probable Cause	Recommended Action
CHT 500 400 300	EGT and CHT not uniform	Dirty fuel injectors or fouled plugs.	Check injectors and plugs. Non-uniformity is normal for carbureted engines
CHT 500 400 300	Decrease in EGT for all cylinders	Decrease in airflow into the induction system. Carb or induction ice. Engine units set to Celsius	Check for change in manifold pressure. Check that the alarm limits are set to Celsius degrees
CHT 500 400 300	Slow rise in EGT. Low CHT	Burned exhaust valve. CHT is low due to low power output.	Have compression checked.
CHT 500 400 300	High CHT on cylinders on one side of engine	Obstruction under cowling.	Check for improper installed baffling, cowl flap misalignment or bird nests.
CHT 500 400 300	EGT on one cylinder jumps up and down 100°	Spark plug fouling at higher temperatures.	Check spark plug.
CHT 500 400 300	Sudden off scale rise for any or all cylinders	Pre-ignition or Normalize view. or failed probe	Full rich and reduce power. Change to Percentage view. Check probe

Display	Symptom	Probable Cause	Recommended Action
(no picture)	Loss of peak EGT	Poor ignition or vapor in fuel injection system.	Have magneto tested.
(no picture)	Decrease in peak or flat EGT response to leaning process	Detonation. Usually the result of 80 Octane fuel in 100 Octane engine.	Enrich mixture, reduce power and relean mixture. Repeat to find power setting where normal peak is obtained or run rich.
CHT 500 400 300	Below 10,000 ft. full throttle causes EGTs to rise	Weak or defective mechanical fuel pump.	Apply booster pump. If EGTs drop, replace fuel pump.
CHT 500 400 300	CHT more than 500°, EGT normal. Adjacent EGT may be low	Leaking exhaust gasket blowing on CHT probe.	Look for white powder around cylinder to determine leak area.

Alarms

The EDM has programmable alarms. When a parameter falls outside of its normal limits, the digital display will flash with the value and abbreviation of the alarming item. If the condition triggering the alarm returns to within normal limits, the display will stop flashing the alarm. If your installation includes a separate panel mounted alarm warning enunciator light or audible warning, it too will be activated.

There are no alarms for the individual EGTs because the temperature values can assume different ranges depending on the flight configuration—run up, climb, cruise. However there *is* an alarm on the DIF parameter, the difference between the hottest and coolest EGTs. DIF—or span—is the important parameter for monitoring the EGTs. See "Factory Set Default Limits" on page 44 for a list of the alarms and their factory default settings.

When an alarm is displayed, *tapping* the STEP button will temporarily disable the alarm indication for the next ten minutes.

When an alarm is displayed, *holding* the STEP button until the word OFF appears will disable that alarm indication for the remainder of the flight. See "Alarm Limits" on page 44.

Alarm Priority

If multiple alarms occur simultaneously, the higher priority alarm will temporarily "mask" the lower priority alarm(s). When an alarm occurs, note the cause of the alarm and tap the STEP button to clear the alarm indication so that you will be notified of any other alarm that might have occurred. The alarm priorities are as follows:

Highest priority	**CHT**	High CHT
	OIL	High OIL temperature
	TIT	High TIT
	OIL	Low OIL temperature
	CLD	**EXCESSIVE CHT COOLING RATE**
	DIF	Excessive EGT span
	BAT	High battery voltage
	BAT	Low battery voltage
	MAP	Overboost Manifold pressure
	LO FUEL	Low fuel quantity remaining
Lowest priority	**LO TIME**	Low fuel endurance remaining

Pre-Ignition and Detonation

Combustion that is too rapid leads to detonation and possibly pre-ignition. *Detonation* is abnormally rapid combustion where the fuel-air mixture explodes instead of burning uniformly. It causes the EGT to decrease and the CHT to increase, and can appear during the leaning process. It occurs under high compression from fuel with too low an octane rating, or from avgas contaminated by jet fuel. Fuel additives, such as lead, boost the octane rating and slow down the combustion process, producing an even pressure to the piston.

Pre-ignition is caused by hot spots in the cylinder. Ignition occurs prior to the spark plug firing. The EDM depicts pre-ignition as a sudden red line of the EGT on the analog display. This may occur in one or more cylinders. The affected cylinder column(s) will flash while the digital display will show an EGT higher than 2000°F. **At this temperature pre-**

ignition will destroy your engine in less than a minute unless you take immediate corrective action.

Section 5 - <u>Data Logging</u>

On monthly intervals, you may choose to jot down peak EGT, parameter sequence values, and cruise engine settings on a *data logging worksheet* in the back of this book. Look for trends as well as absolute values. DIF is a good indicator of the overall health of the engine. Typical values are less than 80 F° for a factory new fuel injected engine, and less than 150 F° for a carbureted engine. If you discover a DIF spread greater than this, identify the effected cylinder and initiate preventive maintenance.

Trend data for EGT and CHT is also of value. Any departure from a cylinder's baseline requires investigation. Refer to the "Engine Diagnosis Chart" on page 23. Data logging as a means of identifying trends is of considerable value in preventative engine maintenance.

EDM Data Logging Worksheet

This is an example of an entry into the worksheet. A blank worksheet is provided in the back of this guide for you to use.

| Date | Tach | Alt | EGT / CHT | | | | | | TIT | DIF | RPM |
			#1	#2	#3	#4	#5	#6			MP
2/23/96	453	95	1350	1360	1390	1370	1380	1370	1450	40	2350
			378	382	365	385	369	385			28

Section 6 -Fuel Flow Option Operation

Fuel Flow Display Select Switch

The select switch is a three-position toggle switch mounted on your instrument panel near the display of the EDM. It affects only the display scan.

- In the **EGT** (**T***emperature)* position only the installed temperature (and battery voltage) parameters are displayed.

- In the **ALL** (**A***ll*) position, the EDM both installed temperature and fuel flow parameters are displayed.

- In the **FF** (**F***uel Flow)* position only fuel flow parameters are displayed.

Any alarm warning will appear regardless of the select switch setting. These parameters are displayed in the digital display in either the Automatic or Manual modes or during the pilot programming procedure. The select switch does not effect the analog display.

Start Up Fuel

After initial self-test, you will be asked to inform the EDM of start up fuel. The EDM will display FUEL for one second, and then flash FILL? N until any button is pressed. If your aircraft has tank fill tabs and no auxiliary tanks, you can use the auxiliary tank feature to select either filling to the tank tabs or topping the tank. See "Main Tank Capacity" and "Auxiliary Tanks" beginning on page 47 to program the EDM for this feature. The EDM does not differentiate fuel flow between the main and auxiliary tanks; it considers only *total* fuel in the aircraft. **During flight you may also inform the EDM of startup fuel using the pilot program mode display if you forgot to do so at start up.**
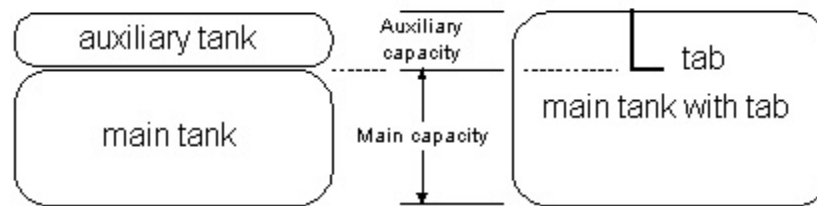
Refer to the column in the chart below corresponding to your fuel tank configuration. Tap the LF button to select one of the four following fueling choices on the left column of the chart.

LF to choose	*Main tanks only, no tabs*	*Main tanks with tabs*	*Main & Auxiliary tanks*
`FILL?` `N`	**DID NOT ADD ANY FUEL SINCE LAST SHUTDOWN.**		
`FILL` `75`	Topped the main tanks.	Filled only to the tabs.	Topped the main tanks. If some additional fuel is added to the auxiliary tanks, you will input this next when `.0 GAL` is displayed
`FILL` `I20`	(not available)	Topped the main tanks.	Topped both the main and auxiliary tanks.
`FILL` `+`	**DID NOT TOP, BUT ADDED ADDITIONAL FUEL TO THE AIRCRAFT, OR REMOVED FUEL FROM THE AIRCRAFT.**		

Then tap the STEP button to complete the entry and advance to the Manual mode.

Adding Fuel and Auxiliary Tanks

If you either
   a) added less than full fuel to only the main tanks, or
   b) topped the main tanks but have some fuel remaining in the auxiliary tanks,
then select `FILL   +` and the next display will ask you how much you added: `.0 GAL` (or selected units). Hold the LF button to count up, tap the LF button to count down. The count up will stop at full tanks, since you cannot add more fuel than would top the tanks.

If you added fuel to only the main tanks, then input how much you added.

If you topped the main tanks, but have some fuel remaining in the auxiliary tanks, input how much is now in the auxiliary tanks.

You can "add" a negative amount of fuel if you remove fuel from the aircraft or wish to correct the total quantity of fuel on board.

Accumulate Total—Trip Total

You may either display total fuel *used* since the last time you informed
the EDM that the aircraft was refueled, or for an extended trip with
multiple fuel stops. This selection affects only the USD parameter. How
to select whether to accumulate or reset is described in "Pilot
Programming" beginning on page 36.

Resetting "USED"

Every time you inform the EDM that the aircraft is refueled, the amount
of fuel *used* is set to zero, unless the instrument is programmed to
accumulate. The display of fuel *used* pertains only to the fuel used since
the last time you informed the EDM that the aircraft was refueled.

To reset to zero the amount of fuel *used* at any point in time, manually
step to display USD and hold both buttons for five seconds until the
display shows .0   USD.

Fuel Management

Without a means of measuring fuel flow, you must rely on the aircraft
fuel gauges or total time of flight. Aircraft fuel gauges are notoriously
inaccurate (they are only required by the FAA to read accurately when
displaying *empty).* And measuring time of flight is only an
approximation, and assumes a constant fuel flow rate for each phase of
flight.

The EDM Fuel Flow Option uses a small, turbine transducer that
measures the fuel flowing into the engine. Higher fuel flow causes the
transducer turbine to rotate faster which generates a faster pulse rate.
Because the transducer turbine generates thousands of pulses per gallon
of fuel, it can measure with high resolution the amount of fuel that flows
into the engine. Prior to engine start you inform the EDM Fuel Flow
Option of the known quantity of fuel aboard, and it will keep track of all
fuel delivered to the engine.

Parameter Scan—Systems with Fuel Flow Option

The EDM steps through the engine parameters in a specific sequence.
Listed below is the sequence, parameter description and example of the
digital display.

Parameter Start Up Sequence with Fuel Flow Option

The first column indicates what position the select switch must be in to display that particular parameter. T is EGT, F is FF and A is ALL.

Select Switch	Parameter Description	Example	Comments
T, A	**Voltage**, System Bus	I4.2 BAT	**BATTERY VOLTAGE**
T, A	**Outside Air** Temperature	8I OAT	°F or °C
T, A	**Induction** Air Temperature	I25 IAT	Out of intercooler
T, A	**Compressor Discharge** Temperature	300 CDT	Into intercooler
T, A	**Carburetor** Temperature	−22 CRB	Not available when CDT is installed
T, A	**Difference** between hottest and coldest EGT	80 DIF	Dot indicates most widely deviating cylinder
T,A,F	**RPM**	2450 RPM	RPM
T,A,F	**MAP**	23. I MAP	Manifold pressure
F, A	**Fuel Remaining**	37.2 REM	In gallons, liters or pounds or kilograms
F, A	**Fuel required to next GPS WPT or Destination**	25.9 REQ	Present with GPS interface Valid signal and way point
F, A	**Fuel Reserve at next GPS WPT or Destination**	I I.3 RES	Present with GPS interface Valid signal and way point
F, A	**Nautical Miles per Gal**	I3.0 MPG	Present with GPS interface and valid signal or MPK, MPL, MPP
F, A	**Time to Empty**	02.45 H.M.	**H**ours. **M**inutes Remaining at current fuel burn
F, A	**Fuel Flow Rate**	I3.5 GPH	Or KPH, LPH , PPH
F, A	**Total Fuel Used**	38 USD	**SINCE LAST REFUELING OR TRIP TOTAL.**

T, A	**EGT, CHT**	`I340` `376`	EGT, left, CHT, right. Dot indicates cylinder
T, A	**TIT**, Turbine Inlet Temperature	`I370` `I3.5`	Turbine #1, left and fuel flow right
T, A	**Oil** Temperature	`I 7 8` `OIL`	
T, A	**Shock Cooling**	`-30` `CLD`	Dot indicates fastest cooling cylinder

> **For fuel calculations to be accurate, it is imperative that you inform the EDM of the correct amount of fuel aboard the aircraft. Do not rely on fuel flow instruments to determine fuel levels in tanks. Refer to original fuel flow instrumentation for primary information**

Section 7 - <u>Long Term Data Memory</u>

The EDM Long Term Data Memory will record and store **all** displayed parameters once every **six seconds** (or at the programmed interval of between 2 to 500 seconds). At a later time it will transfer them to a PC using a Palm™ Computer as a intermediate courier, or directly to a laptop PC. You can select to *record*, or to output in *real-time*, but not both at the same time. (To turn on or turn off the recording feature, see "Changing the Alarm Limits" on page 45.)

If you select to output in real-time, refer to the description in the section, "Real-Time Serial Data Port" on page 48.

When you retrieve recorded data to your Palm Computer or laptop PC you can choose to retrieve *all* the data in stored in the EDM, or only the *new* data recorded since your last retrieval. In either case, no data in the EDM is erased. The data will be saved in the Palm Computer or PC in a file in a compressed format. The PC program supplied with the Long Term Data Memory will decompress the data for display and use by other programs, such a MS Excel or Lotus 123.

The amount of total data that the EDM can store will vary depending on how rapidly the measured temperatures change. The typical storage is up to 20 hours at a 6 second interval (1200 hours at 6 minute interval), but may vary depending on which options are installed. When the memory becomes full, the oldest data will be discarded to make room for the newest. You may place a mark at the next data record by tapping the LF button twice. You will see the word SNAP within the next six seconds, indicating a data record has been marked. Tap the STEP button to return to the Automatic mode. Recording begins when EGTs are greater than 500°F or "snap" is requested.

All data are time-stamped. The EDM Long Term Data Memory contains a real-time clock that may be reset to local time when you initially program your instrument. You may also program an *aircraft id* that will

appear in the output data file. The aircraft id can be your aircraft registration number or your name. Initially the *aircraft ID* is set to the EDM's serial number.

You may change the record interval from 2 to 500 seconds, even in flight. When you change the interval in flight, the current flight file is closed, and a new flight file is created with the new record interval.

At power on, the EDM will execute its self test and then display the date (e.g., `I  I.  I2.0  I`), the time (`I3.26`), the percentage of memory filled since the last save (`FULL     24`), and the Aircraft ID.

Downloading data to the Palm Computer

The examples shown here are specifically for the Palm™ computer and a PC running Windows® 98. J. P. Instruments provides an optional cable to interface to the Palm cradle cable or travel cable. J. P. Instruments has a downloadable data transfer application program for the Palm series called EzPalm™.

Downloading the EzPalm Program from the Internet

Go to our web page www.jpinstruments.com, go the *Home* page and then go to the *downloads* page. Double click on EZPALM2.ZIP. When the *File Download* window appears select *Save this file to disk*. Save the file to folder C:\Palm\Add-on.

Using Windows Explorer, go to the folder C:\Palm\Add-on and double click on the file name EZPALM2.ZIP. In the new Windows Explorer window that opened, double-click on EZSAVEP.EXE. Select *Extract All*. Accept the default directory C:\Palm\Add-on\EZPALM2 and select *Next*. Answer *Yes* and select *Finish*.

*Installing EzPalm on the Palm Computer*

Do one of the following:

1. Using Windows Explorer, go to directory C:\Palm\Add-on\EZPALM2 and double-click on EzPalm.prc. Click Done, Click OK. Or

2. From the Palm Desktop program click on the *Install* button. Click Add, select directory C:\Palm\Add-on\EZPALM2, select EzPalm.prc, Click Open, Click Done, Click OK.

HotSync® your Palm Computer. The EzPalm icon should now appear on your applications screen.

Memory Data Capture & Import

With the Palm Computer you can transfer memory data into a file and then later HotSync the data into your PC and import it into EzSaveP™. Here are the steps used to perform these two operations.

Transferring Recorded Data from the EDM-700/800 to the Palm Computer
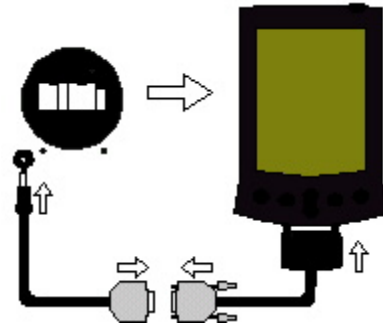
To transfer recorded data to your Palm Computer, proceed as follows:

1. Connect the Palm Computer cradle or travel cable option (available from Palm Computing) to the JPI Palm Download cable (gray). Insert the small round plug of the JPI cable into the data connector on your aircraft instrument panel, and the cradle or travel cable to the Palm Computer.

2. Simultaneously hold the STEP and LF buttons for five seconds. You will see the word PROGRAM for two seconds. Tap the STEP button until you see the question DUMP?   N.

3. Tap the LF button once or twice to select either NEW or ALL.

    • NEW will transfer only data *newly* recorded since you last saved your data.

    • ALL will transfer *all* the data that is in the EDM memory.

    In either case, **no data will be erased** from the EDM.

4. On the Palm Computer, tap the EzPalm icon.

    Tap the EzCapture™ button. The Palm Computer will wait a few seconds for you.

5. On the EDM-700/800, tap the STEP button to begin the transfer process. The EDM-700/800 display shows the percentage of memory remaining to be transferred. When this number reaches zero, the transfer is complete. If you want to terminate the transfer before it is

For Your Safe Flight   Page 37

complete, simultaneously hold the STEP and LF buttons for five seconds.

6. The Palm Computer will close the file named with today's date. Tap Exit to end EzPalm or tap Explorer to view the file list.

7. The EDM display will show SAVE D?N.

   - If you have successfully dumped the data to your PC, tap the LF button to display SAVE D?Y and then tap STEP. This will reset to zero the percentage of memory filled since the last save. **No data will be erased.**

   - If you did not dump the data to your PC and wish to do so later, leave the message SAVE D?N and tap STEP. You will be asked if you are finished using the program mode by the message: END Y. Tap STEP if done. Tap LF to change the message to END N and stay in the program mode. Tap STEP to continue.

Transferring Data from the Palm Computer to your PC in Excel compatible format

1. Place the Palm Computer in the cradle and begin a HotSync. Your file will be placed in the folder C:\Palm\YourName\Backup where YourName is the folder corresponding to your Palm Computer user name. The file will have a name similar to P010318a.PDB corresponding in this example to the date 2001, March 18.

2. Using MS Explorer, move the file P010318a.PDB to the folder containing the EzSAVEP.exe application—such as C:\Palm\Add-on\EZPALM2.

3. To run EzSAVEP on the PC, go to directory C:\Palm\Add-on\EZPALM2 and run EXSAVEP.EXE. From the main menu use the up and down arrow keys to select De-Compress Palm Pilot Data. Use the up and down arrow keys to select the file to decompress. Press the <Enter> key.

EzSAVEP will create one or more .CSV files, each of which corresponds to one flight, for example F010318A.CSV.

Data Analysis

The data stored in the .CSV file is a comma separated value file. MS Excel® and other spreadsheets will import the file without further prompting. A program that doesn't recognize .CSV files will ask you

how to interpret the data. Select delimited; delimiters: comma; *text qualifier:* **"** (quote).

```
"EZSave    3-13-2001"
"EDM- 700  V 270  J.P.Instruments  (C) 1998"
"Aircraft Number N1205X_"
"Flight #5  11/12/98  11:46:24"
"Eng Deg F    OAT Deg F    F/F GPH"
"Duration   4.44 Hours  "
"TIME","E1","E2","E3","E4","E5","E6","C1","C2","C3","C4","C5","C6","DIF","CLD",
"OAT","BAT","FF","USD","MARK"
"11:46:24",1375,1323,1386,1342,1437,1323,355,365,340,368,329,353,114,0,
75,13.9,12.8,21,"S"
"11:46:30",1376,1323,1387,1343,1438,1324,354,365,342,369,330,353,115,0,
75,13.9,12.8,21,""
"11:46:36",1375,1322,1385,1342,1436,1325,356,365,343,367,332,353,114,0,
75,13.9,12.8,21,""
"11:46:42",1376,1320,1385,1340,1437,1324,355,365,345,368,331,353,113,0,
75,13.9,12.8,22,""
```

The line

```
"TIME","E1","E2","E3","E4","E5","E6","C1","C2","C3","C4","C5","C6","DIF","CLD",
"OAT","BAT","FF","USD","MARK"
```

is the header text and is listed in the file only once. It describes the contents of each subsequent line of data starting with time in hours:minutes:seconds. The next labels are E1…E6 for EGTs, then C1…C6 for CHTs. The DIF, CLD, OAT, BAT, FF and USD are the same as on the EDM-700 display. The MARK field will be an "S" if the data was marked by pressing the LF button twice.

Import the data to your Excel or Lotus 123 spreadsheet and follow the directions for your spreadsheet for analyzing and plotting data.

Section 8 - Personalizing

Pilot Programming

To start the Pilot Programming Procedure, simultaneously hold the STEP and LF buttons for five seconds. You will see the word **PROGRAM** for two seconds and then the sequence shown in the chart below. Tap the STEP button to advance to the next item in the list. Tap the LF button to select alternate values of that item. The shaded areas in the chart below pertain only to the Fuel Flow Option.

For Your Safe Flight   Page 39

Select switch	Tap **STEP** to advance to the next item	Tap LF to sequence through these values	Comments
T, F, A	`PROGRAM`		**STAYS ON FOR TWO SECONDS. HOLD BOTH BUTTONS FOR 5 SECONDS SET UP THE FACTORY ORIGINAL TIT (SEE PAGE 40).**
T, F, A	`FUEL ?` `N`	`N    Y`	Y—Yes—to change fuel status (see page 28).
T, A	`RATE   4`	`0 ... 9`	Index rate (pause time) in the Automatic Mode. 0 disables the Automatic Mode.

T, A	`OAT F`	`OAT`
		`F`
		`OAT`
		`C`
			To calibrate the OAT ±10°, hold both the STEP and LF buttons simultaneously for five seconds, which will proceed to the next step. Otherwise the next step will be skipped.

T, A	`OAT+0`	`OAT-I0`
		...
		`OAT+I0`
			This step will be normally be skipped.
			
			Adjust the indicated temperature up or down by up to 10°. For example, `OAT+3` adjust the OAT 3° higher.

T, A	`EGT`
	`I?N`
		`EGT`
		`I?N`
		`EGT`
		`I?Y`
			Y—Yes—sets the digital display to one-degree resolution; N—No—sets 10°. (10° resolution is easier to interpret the EGTs.)

	`HP - ?` `Y`	`N    Y`	Y—Yes—displays %HP in the upper digital window. N—No—displays RPM in the upper digital window. Hold STEP and LF for 5 seconds to adjust the horsepower constant.

T, A		`70` HP
		
		`HPC=`
		`I25`
			%HP display will change when HP constant is adjusted. See Programming the EDM-800 Horsepower Constant beginning page 38. Hold STEP and LF for 5 seconds to set the MAP calibration. Tap STEP to exit.

T, A	`MAP=29.9`		Set to value in chart, section starting on page 39. Tap STEP to exit.

F, A	KF-SET	29.00=K F	KF-set, hold both STEP and LF buttons simultaneously for five seconds to begin the next sequence.
		29.00=K F	29.00 One digit will be flash and the LF button will adjust up or down. STEP to next digit. Hold both buttons to exit set mode.
F, A	ACCUM?N	ACCUM?N ACCUM?Y	N—No—Upon informing the EDM that you refueled the aircraft, reset total fuel used to 0. Y—Yes—accumulate total fuel used rather than reset to 0 at each refueling.
F, A	GPS - C = 2	0 ... 6	**GPS COM FORMAT.**
T, F, A	DUMP? N	N NEW ALL	Memory dump. Select to transfer ALL or only NEW data. The END Y step is skipped after a successful a Long Term Memory DUMP.
T, F, A	END Y	END Y END N	Y—Yes to exit; N—No to review list again.

Section 9 - Programming the EDM-800 Horsepower Constant

You must adjust the HP Constant once for your aircraft. The **Fuel Flow Option is required to be installed to display percent of horsepower.** The default display will be RPM if Fuel Flow is not operational. You must perform this adjustment in the air while the aircraft is in flight.

1. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for five seconds.

2. Tap STEP repeatedly until you see **HP-?   Y**. If you see **HP-? N**, change the N to a Y by tapping the LF button, then hold both the STEP and LF buttons display until you see HPC=   I25.

3. Referring to the Aircraft Flight Manual (AFM) set the engine to a constant power setting of 65 to 70% at 25° to 50° Rich of peak and maintain straight and level flight at any altitude below 10,000 feet. View the reading in the %HP display and see how close it is to your current engine percent HP. If the value in the display not at your current engine percent HP setting, then change the HP reading by

adjusting the HP constant in the lower display by holding or tapping the LF button. **Note: the reading is the *percent of maximum* HP, not total HP.**

4. Keep adjusting the HP constant until the upper window displays the same power level as the current engine percent HP.

5. Tap the STEP button to exit.

Section 10 – Programming Manifold Pressure (MAP)

Do this one time and only if the MAP on your manifold pressure gauge doesn't match the MAP shown on the EDM-800.

1. Do this on the ground with the engine turned off.

2. Enter the pilot program mode by simultaneously holding the STEP and LF buttons for five seconds.

3. Tap STEP to index to **HP-?   Y**.

4. Hold both the STEP and LF buttons and you will see **HPC**=   **I25.**

5. Hold both the STEP and LF buttons and you will see **MAP**=   **29.9.**

6. Use **one** of the following two methods to calibrate the MAP.

   A. Easy calibration: set the EDM-800 MAP to the same value as shown on your aircraft's manifold pressure gauge. Tap or hold the LF button to change the MAP value.

OR

   B. Absolute calibration: the table below shows the MAP for a given field elevation (down the left side of the table) and altimeter setting (along top row of the table). Find the entry in the table most closely matching your field elevation and current altimeter setting. Interpolate if necessary.

Alt setting-> field elev.	29.0	29.2	29.4	29.6	29.8	29.9	30.0	30.2	30.4	30.6	30.8	31.0
0	29.0	29.2	29.4	29.6	29.8	29.9	30.0	30.2	30.4	30.6	30.8	31.0
1000	28.0	28.2	28.4	28.5	28.7	28.8	28.9	29.1	29.3	29.5	29.7	29.9
2000	27.0	27.1	27.3	27.5	27.7	27.8	27.9	28.1	28.3	28.5	28.6	28.8
3000	26.0	26.2	26.3	26.5	26.7	26.8	26.9	27.1	27.2	27.4	27.6	27.8
4000	25.0	25.2	25.4	25.6	25.7	25.8	25.9	26.1	26.3	26.4	26.6	26.8
5000	24.1	24.3	24.5	24.6	24.8	24.9	25.0	25.1	25.3	25.5	25.6	25.8
6000	23.2	23.4	23.6	23.7	23.9	24.0	24.0	24.2	24.4	24.5	24.7	24.8
7000	22.4	22.5	22.7	22.8	23.0	23.1	23.1	23.3	23.5	23.6	23.8	23.9

> **Do not set MAP to the local altimeter (Kollsman window) setting since that setting is the pressure at sea level, and is not the same as your field elevation pressure.**

Tap or hold the LF button to change the MAP value.

7. Tap the STEP button to exit.

Section 11 – Programming use of Factory Original TIT Probe

If your aircraft is using the factory original TIT probe and gauge, you should calibrate the EDM for that probe. The factory original TIT probe must be a type K and the leads must be wired red-to-red and yellow-to-yellow. Both the EDM and factory original gauge may be used concurrently. Due to the high input impedance of the EDM instrument, it will not affect the accuracy of the factory installed probe or gauge.

In normal cruise flight, record the difference between the factory installed TIT gauge and the EDM TIT reading.

TIT gauge _____ EDM _____.

If you haven't already done so, start the pilot programming procedure, by simultaneously holding the STEP and LF buttons for five seconds. You will see the word PROGRAM for two seconds.

Tap **STEP** *to advance to the next item*	*Tap the* **LF** *button to sequence through these values*	*Comments*
PROGRAM		Stays on for two seconds.
RATE 4	RATE 4	hold both STEP and LF buttons simultaneously for five seconds to begin the next sequence.
ORIG TIT	ORIG T-N ORIG T-Y	Y—Yes—selects factory original TIT probe and proceeds to the next step.
CAL TIT	- 975 … +975	Tap the LF button to lower the correction; hold the LF button to raise the correction. For example, if the EDM reads 100 less than the aircraft's TIT gauge, set the display to read TIT +I00.
		Tap STEP button to exit the procedure.

Section 12 - Programming the Fuel Flow Option

Fuel Flow Parameters

Three additional parameters may be set by the pilot when the Fuel Flow Option is installed:

- K Factor—the fuel flow transducer calibration constant.
- Accumulate—default is OFF: resets the fuel *used* to 0 every time you inform the EDM that the aircraft was refueled. With accumulate ON fuel *used* will not be reset to 0 when you inform the EDM that the aircraft was refueled.
- GPS Communications fuel data format.

K Factor

The K factor is shown on the fuel flow transducer as a four-digit number, which is the number of pulses generated per gallon of fuel flow. **Before installing the transducer, write down the K factor here _____.** To enter the number, move the decimal point three places to the left. For example if the K factor on the fuel flow transducer is 29,123, enter 29.12 in the K factor parameter.

The K factor can be changed in the pilot programming procedure. *When the K factor is changed during a trip, calculations of fuel used, fuel remaining and time to empty are not retroactively recalculated.*

Fine Tuning the K Factor

The K factor shown on the fuel flow transducer does not take into account your aircraft's particular installation. Fuel hose diameters and lengths, elbows, fittings and routing can cause the true K factor to be different from that shown on the fuel flow transducer.

You must use the following procedure to fine tune the K factor.

1. Make at least three flights of about two to three hours each. Note the actual fuel used (as determined by topping the tanks) and the EDM calculation of the fuel consumed for each flight = USD.

Flight	Fuel USED shown by EDM (total tank - REM)	Actual fuel used by topping tanks
1		
2		
3		
Total	❶	❷

2. Total ❶ the EDM fuel used and ❷ the actual fuel used.

3. Record the current K factor here ❸_____ and in the table below.

4. Calculate the New K Factor as follows:

New K Factor = (❶EDM fuel used) x (❸Current K factor)
             (❷actual fuel used)

New K Factor = (❶_____) x (❸_____)
             (❷_____)

Every time you fine tune the K factor, record the measurements here:

Date	❶EDM fuel used	❷actual fuel used	❸Current K factor	New K factor = ❶x❸/❷	Pilot's initials

Fuel Flow Option Programming Procedure

Setting the K factor

This procedure is different than for setting other parameters. Place the select switch in the FF position. If you haven't already done so, start the pilot programming procedure, simultaneously hold the STEP and LF buttons for five seconds. You will see the word PROGRAM for two seconds.

1. Tap STEP button to advance to the KF-SET screen 29.00=KF
2. Hold both the STEP and LF buttons simultaneously for five seconds. First digit flashes (shown here as a larger digit only for illustration purposes): 29.00

3. Tap or hold the LF button to change flashing digit: I 9.00
4. Tap STEP button for next digit: I **9**.00
5. Tap or hold the LF button to change flashing digit: I 8.00
6. Tap STEP button for next digit: I8.00
7. Repeat items 5 and 6 for the remaining two digits.
8. Hold STEP and LF buttons simultaneously for five seconds to exit.

Accumulate Total—Trip Total

Select "No" if you wish to display total fuel used since the last time you informed the EDM that the aircraft was refueled. Select "Yes" to display total fuel used for an extended trip with multiple fuel stops. This selection affects only the USD parameter.

GPS-C Comm settings

The GPS-C setting selects the format of the *fuel data* output of the EDM. See "Setting GPS-C Fuel Flow Communications Format" on page 50.

Section 13 —Programming Long Term Data Memory

If you haven't already done so, start the pilot programming procedure, simultaneously hold the STEP and LF buttons for five seconds. You will see the word PROGRAM for two seconds. To change the date, time and user id for the Long Term Data Memory, tap the STEP button until the display shows DUMP?   N. Next, simultaneously hold the STEP and LF buttons for five seconds. Then set the date and time as show below:

STEP	LF	*Comments*
TIME	2 500	Record time interval, in seconds
MNTH	I I2	Month
DAY	I 3I	Day
YEAR	80 79	Year (note: represents 1980 through 2079)
HOUR	OO 23	24 hour time. We suggest you set Zulu time
MIN	OO 59	**THIS ALSO ZEROS THE SECONDS**
N---- -	**N** I2345	Current Aircraft ID. To *change* Aircraft ID, hold both STEP and LF buttons until the first character flashes. LF selects the first character. STEP moves to the next

	6	selects the first character. STEP moves to the next character. To *Save*, hold both STEP and LF for 5 sec.
END Y		Tap STEP button to exit the procedure.

Section 14 -<u>Alarm Limits</u>

Factory Set Default Limits—Non-Primary

JPI conservatively sets the default alarm limits below Lycoming and Continental recommendations.

Parameter	*Default Low Limit*		*Default High Limit*		*Alarm Example*	
CHT			450°F	230°C	465	**CHT**
OIL	90°F	32°C	230°F	110°C	280	**OIL**
TIT			**1650°F**	**900°C**	I 720	**TIT**
CLD			-60°F/min.	-33°C/min.	-65	**CLD**
DIF			500°F	280°C	525	**DIF**
BAT, 24 V	24V		32V		22 .4	**BAT**
BAT, 12 V	12V		16V		I7.6	**BAT**
MAP			42 inches		46.3	**MAP**
LO FUEL	45 min				00.20	**H.M**
LO TIME	**10 GAL, KG, LTR, LBS**				7.2	**REM**

If you change the display between Fahrenheit and Celsius, newer instruments will automatically change the alarms to the factory limits.

When an alarm is displayed, tapping the STEP button will temporarily delete that parameter from the sequence for the next ten minutes. When an alarm is displayed, holding the STEP button until the word OFF appears will delete that parameter from the sequence for the remainder of the flight.

Changing the Alarm Limits

You may prefer to set your own alarm limits Follow the procedure outlined below to change any of the factory default settings.

To start the alarm limit procedure, after power up, wait until the EDM completes its self test and is in the Automatic or Manual mode. If in doubt, tap the STEP button a few times. Then follow the steps depicted here:

Hold both buttons for 5 seconds until the word PROGRAM → Tap STEP button until the words END Y → Hold both buttons for 5 seconds until the words FAC LIM
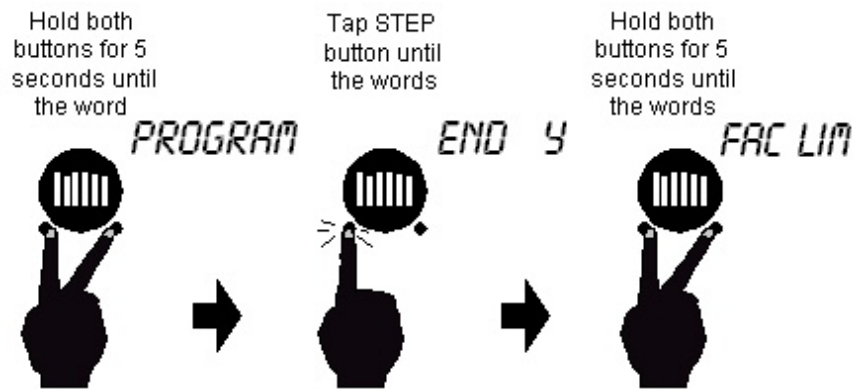
The display will then sequence as shown in the chart below. Tap the STEP button to advance to the next item in the list. Tap the LF button to select alternate values of that item. *Hold* the LF button to increase a numerical value; *tap* the LF button to decrease a numerical value. The shaded areas in the chart below pertain only to the Fuel Flow Option.

Changing the Alarm Limits Procedure:

Tap **STEP** *to next item*	**LF** *sequences through these value ranges*	*Description*
FAC? N	FAC? N FAC? Y	Restore factory defaults?
ENG F	ENG F ENG C	Select F or C degrees for all engine temps. You must also change the alarm limits to °F or °C.
I6.0 H BAT	I0.0 H BAT … 35.0 H BAT	Battery high voltage limit, set in 0.5 volt increments.
I2.0 L BAT	8.5 L BAT … 30.0 L BAT	Battery low voltage limit.
500 DIF	30 DIF … 990 DIF	EGT difference limit, set in 10° increments.
450 H CHT	90 H CHT … 500 H CHT	CHT high limit, set in 5° increments.*
−60 CLD	−5 CLD … −200 CLD	Cooling limit, set in 5°/min. increments.
I650 TIT	650 TIT … 2000 TIT	Also sets the maximum scale of the EGT and TIT bar graph.*
230 H OIL	40 H OIL … 500 H OIL	Oil temperature high limit, set in 5° increments.*
90 L OIL	I0 L OIL … 250 L OIL	Oil temperature low limit set in 5° increments
MAP=42	MAP=25 … MAP=60	MAP overboost alarm (EDM-800 only)
FUEL GAL	FUEL GAL FUEL KGS FUEL LTR FUEL LBS	Selects the units in **all** parameters where fuel quantity or fuel rate is displayed
MAIN=50	MAIN=0 … MAIN=999	Main tank capacity, in units selected
AUX? N	AUX? N AUX? Y	Y—Yes—aircraft has auxiliary tanks
AUX=0	AUX=0 … AUX=250	Auxiliary tank capacity
MIN =45	MIN =0 … MIN =60	Alarm limit in minutes for low time in tanks
REM =I0	REM =0 … REM =200	Alarm limit for low fuel quantity in tanks, in units selected

Engine Data Management

CARB?	CARB? N CARB? Y	Y—Yes—carbureted engine
RECRD?	RECRD? Y RECRD? N	Long Term Memory. Y—only data recording. N—only real-time data output.
CYL=6	CYL=4 … CYL=I 2	(EDM-800 only) Set the number of cylinders. See page 48 for exceptions.
	END Y END N	Y—Yes to exit; N—No to review list again

MAP, Fuel Flow Alarm Limits, Units, Fuel Capacity

MAP Overboost Alarm

Enter the redline for overboost on turbocharged engines.

Fuel Flow Units

Selects the units in *all* parameters where fuel quantity or fuel rate is displayed. If you change this parameter, it does *not* change the numerical value of the fuel tank capacity. You must do this manually. For example if you change from Gal. to Lbs., the tank capacity will be interpreted as 50 Lbs. rather than 50 gallons; the EDM will not convert 50 Gal to equivalent pounds.

Main Tank Capacity

Enter the total capacity of the main tanks in the fuel flow units selected. If you have tank tabs (but no auxiliary tanks) and sometimes fill only to the tabs, set the main tank capacity to the capacity up to the tabs.

Auxiliary Tanks

If you do not have auxiliary tanks or tank tabs, answer "No." If you answer "Yes," you will be asked to input the capacity of the auxiliary tanks in the fuel flow units selected. If you have tank tabs and sometimes fill only to the tabs, set the auxiliary tank capacity to the difference between full tank capacity and tab capacity. The EDM does not differentiate fuel flow between the main and auxiliary tanks; it tracks only *total* fuel in the aircraft.

Low Time Alarm Limit

Select the value of the time remaining, in minutes, that triggers the alarm. Time remaining is calculated at the current fuel flow rate.

Low Fuel Alarm Limit

Select the value of the fuel remaining, in the selected fuel flow units, that triggers the alarm. Fuel remaining is calculated at the current fuel flow rate.

Carburetor?

Different response filters are used depending on whether your engine is carbureted or fuel injected. The filter for a carbureted engine has a slower response time to reduce sudden fluctuations in readings.

Number of Cylinders

This applies only to EDM-800. Set `CYL = 4` or `6` depending on your engine. Exceptions:

  - 4 cylinder engine with dual (all-in-one) magnetos set to `CYL= 8`.
  - 4 cylinder Laser ignition set to `CYL=8`.
  - 6 cylinder Laser ignition set to `CYL=I2`.

Section 15 —Real-Time Serial Data Port

Serial Data Output Port Configuration

The real-time serial port is active only if the alarm limit parameter `RECRD` is set to `RECRD? N`.

The RS-232 port on your computer should be configured as follows: 9600 baud, 1 stop bit, 8 data bits, no parity. The connector is 2.5 mm ID, 5.5 mm OD. **Do not connect a power source to the serial output port connector.**

Real-time Serial Data Output Format

Every six seconds a data block is transmitted, formatted as comma delimited ASCII text. Every 60 lines a header line is transmitted. Note: the format for the *recorded data* when using the Long Term Data Memory is compressed binary and not compatible with the text format shown here.

Table of header names for parameters:

header name	parameter	header name	parameter
"E1"	EGT cylinder 1	"OIL"	oil temp
"E2"	EGT cylinder 2	"DIF"	EGT span
"E3"	EGT cylinder 3	"CLD"	shock cooling
"E4"	EGT cylinder 4	"OATF"	outside air temp.
"E5"	EGT cylinder 5	"CDT"	compressor discharge
"E6"	EGT cylinder 6	"IND"	induction
"T1"	TIT #1	"RPM"	RPM
"T2"	TIT #2	"MAP"	manifold pressure
"C1"	CHT cylinder 1	"%HP"	percent horsepower
"C2"	CHT cylinder 2	"BAT"	battery voltage
"C3"	CHT cylinder 3	"GPH"	fuel flow
"C4"	CHT cylinder 4	"REM"	remaining fuel
"C5"	CHT cylinder 5		
"C6"	CHT cylinder 6		

Header line example:

"E1", "E2", "E3", "E4", "E5", "E6", "T1", "T2", "C1", "C2", "C3", "C4", "C5",
"C6", "OIL", "DIF", "CLD", "OATF", "CDT", "IND", "RPM", "MAP", "%HP",
"BAT","GPH","REM"<CR><LF>

In the examples shown here, separate lines are shown for clarity only.
Each line is output as a single string with no imbedded carriage returns
or line feeds, and is terminated with a single carriage return <CR> and
line feed <LF>. If a parameter is not in the sequence it will be omitted
from both the descriptor line and the data line. Outside air temperature
header is either "OATF" or "OATC" depending on the temperature units
displayed.

Data line example:

1390,1340,1390,1360,1420,1340,1450,1460,365,380,334,359,344,365,196,90,
30,76,250,23,2340,20.2,65,28.2,14.2,43
<CR><LF>

If a parameter is removed from the sequence due to a disabled probe, that
parameter will be output as the string "NA" with the quotation marks
included in the string.

Capturing real-time data with a PC Compatible Laptop
Any laptop computer can be used to capture and analyze the real-time
serial data from your EDM. J. P. Instruments provides an optional
connector to interface to a standard 9 pin D serial data port of a PC, or
you may construct your own as shown here:

2.5mm ID, 5.5 mm OD

pin 2 to inner barrel

pin 5 to outer barrel
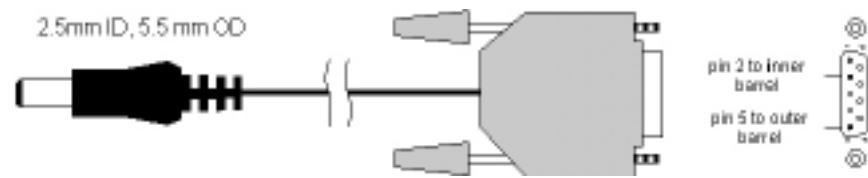
2.5mm ID 5.5mm OD plug	9 pin D subminiature female	Signal
Outer barrel	Pin 5	ground
Inner barrel	Pin 2	signal

J. P. Instruments provides a data capture computer program for the PC called EzRec™. Or you may use terminal emulator software for display and data capture, such as HyperTerminal, supplied with MS Windows.

Navigation Data Formats

Output of GPS; input to EDM. The EDM automatically configures itself for one of three industry standard data formats:

Format	Baud rate	
NMEA-183 (Marine Navigation Data Format)	**4,800**	This is the format for most handheld GPS receivers. Loran must have sentences RMA & RMB. GPS must have sentences RMB & RMC.
Aviation Data Format	9,600	"Output sentence type 1" Required sentences are: A, B, C, D, E, I and L first character identifier byte. Sentence terminator may be either <CR><LF> or <CR> alone.
Northstar (Northstar binary)	1,200	M1 setup select "NO EXTENDED", "NAV ONLY"

Setting GPS-C Fuel Flow Communications Format

GPS-C	Input to GPS; output of EDM
0	No fuel data output
1	Garmin (Shadin Miniflow format)
2	Allied Signal (format B)
3	Arnav/EI fuel data
4	Allied Signal (format C) *
5	(Not used)
6	UPS/Garmin fuel/air data

Diagnostic Messages, Fuel Flow

The following displays indicate a malfunction in the Fuel Flow Option transducer or associated electrical connections:

`0.0  GPH`	Zero's indicate Fuel flow is too low to register
`---` `GPH`	Dashes indicate No fuel flow transducer signals
`---` `H.M`	Dashes indicate No fuel flow transducer signals

GPS Interface Diagnostics

Parameters `REQ, RES, &` `MPG` are all missing from the scan.	No communications from GPS receiver to EDM. Possibly no connection or aircraft GPS is off.
`NO - COM` message and parameters `REQ, RES, &` `MPG` are missing.	Communications are received by EDM and the Auto-Protocol setup is in process. Verify correct output format setup in GPS receiver; check GPS connections.
`NO - SIG` message and parameters `REQ, RES, &` `MPG` are missing.	GPS receiver has insufficient signal for valid data.
`NO - WPT` message and parameters `REQ` & `RES,` are missing.	No waypoints are programmed into the aircraft GPS receiver.
`- - - REQ` or `- - - RES` message	Your ground track is more than ±70° from your course to the next GPS waypoint.

Navigation Data Ports for GPS Comm

(These ports are completely independent of the EDM serial data output port.)

Navigation Data (output of GPS; input to EDM)

> Compatible with RS-232, TTL, RS-423, RS-422 SDA.

> Serial data format: 8 data, 1 start, no parity. Baud rates: 1,200, 4,800, or 9,600 depending on the GPS data output format. The EDM automatically detects the GPS data output format and is independent of the GPS-C setting.

Fuel Data (input to GPS; output of EDM)

RS-232. Serial data format: 8 data, 1 start, no parity. Baud rate: 9,600.

Output format is determined by the GPS-C setting, but may be over-ridden by the GPS navigation format: If the EDM senses Northstar or NMEA-183 navigation data input, there will be no fuel data output.

Section 16 - Option Connector Pin Assignments

Pin no.	Pin no.	Probe or function	Pin no.	Function/ sensor pin	Pin no.	Function
P1 (upper) 25-pin connector for 4 or 6 cylinder engines. See installation manual for 7, 8, 9 cylinder instruments			**MAP-RPM 9-PIN CONNECTOR (EDM-800)**		Fuel Flow Option 15-pin connector	
yel 1	red 2	OIL	grn 1	RPM sig /1	1	RS-232 out
yel 3	red 4	IND	blk 2	RPM grd /2	2	RS-232 in
yel 5	red 6	CARB (or CDT)	red 3	RPM pwr /3	wht 4	FF signal
yel 14	red 15	OAT	red 4	MAP pwr /3	red 5	FF power
yel 16	red 17	TIT	blk 5	MAP grd /1	blk 6	FF return
yel 18	red 19	TIT-2 (2nd TIT)	6	(not used)	7	Switch com
	gry 12	Remote alarm	7	(not used)	8	Switch EGT
	red 13	+ Power	wht 8	MAP sig+ /2	9	Switch FF
	wht 24	RS-232 data port	grn 9	MAP sig- /4	11	Remote FF alarm
	blk 25	Engine ground				

Section 17 -Reference Reading

You may wish to know more about the effect of engine operations on EGT and CHT. The reading list below provides general overviews as well as original references on topics that may be of interest.

General Overview

These references are readily available to pilots and provide a readable source of general technical information.

- Teledyne Continental Motors, *Engine Operation for Pilots*, from the FAA Accident Prevention Program, FAA-P-8740-13.
- Editors of *Light Plane Maintenance* Magazine, *EGT Systems*, Belvoir Publications Inc., Greenwich, CT 06836. 1989.
- *Lycoming Flyer* Issue 53 dated January 93.

Technical Reviews and Original References

For those pilots who have engineering backgrounds, the references listed below present the original research on the combustion process and represent the source documents for those with technical interests.

- A. Hundere, "Autogas for Avgas," *AOPA Pilot*, October, 1969.
- A. Hundere and J. Bert, "Pre-ignition and Its Deleterious Effects in Aircraft Engines," *SAE Quarterly Transactions*, Vol. 2, No. 4, pages 547-562, October 1948.

Section 18 -Technical Support

JPI offers both e-mail and telephone technical support. Have your model and serial number ready when you call. Call ***JPI*** for a return authorization number before returning any equipment.

<div align="center">

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800 345-4574

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</div>

Limited Warranty

J.P. Instruments Inc. (JPI) warrants all parts in your new EDM to be free from defects in material and workmanship under normal use. Our obligation under this warranty is limited to repair or exchange of any defective part of this unit if the part is returned, shipping prepaid, within two years for electronics and one year for probes from the date of original purchase. Installation labor is the responsibility of the aircraft owner. Homebuilt aircraft warranty starts when the aircraft is certified for flight. Replacement parts carry a warranty for the balance of the warranty period.

Under this warranty, JPI is not responsible for any service charges, including removal, installation, nor any other consequential damages. JPI incurs no obligation under this warranty unless a Warranty Registration Certificate describing the warranted product has been completed and mailed to JPI with all information requested.

This warranty is void on any product which has been subject to misuse, accident, damage caused by negligence, damage in transit, handling or modification which, in the opinion of JPI, has altered or repaired the product in any way that effects the reliability or detracts from the performance of the product, or any product whereon the serial number has been altered, defaced, effaced or destroyed.

This warranty is in lieu of all other warranties expressed or implied and other obligations of liability on JPI's part, and it neither assumes nor authorizes any other person to assume for JPI any other liability in connection with the sale of JPI products.

To initiate this warranty, the aircraft owner must submit a completed Data Logging Worksheet to JPI. Upon receiving a completed worksheet, JPI will initiate the warranty from the date of original purchase. Any replacement parts carry a warranty that extends for the balance of the period of the original warranty. For homebuilt aircraft the warranty starts when the aircraft is certificated for flight and noted on the warranty card.

Index

Engine Data Management

EDM-700 Data Logging Worksheet

A/C N _____ Make _____ Model _____ Engine _____

Date	Tach	Alt	EGT / CHT						TIT	DIF	RPM
			#1	#2	#3	#4	#5	#6			MP

Engine Data Management